

***Grand Avenue  
Northwest Corridor Study***

***WORKING PAPER NO. 7  
ALTERNATIVE MODE NEEDS***

***July 24, 2001***

***Prepared for***



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## **EXECUTIVE SUMMARY**

This working paper assesses the alternative mode needs for the Grand Avenue Northwest Corridor. Alternative mode needs were identified based on input from the public and local agencies, review of previous studies and community plans, and field review of existing conditions.

### **Public Transit**

Citizens and agency staff expressed the following needs at the agency/community forums and public open house:

- Study high capacity transit alternatives to link the study area with other communities in metropolitan Phoenix.
- Consider passenger light rail service in the corridor.
- Consider commuter rail service in the BNSF right-of-way.
- Provide park-and-ride lots. (MAG has tentatively identified sites in the Grand/SR 101 and Grand/Litchfield Road areas.)

Exhibit ES.1 provides a summary of transit needs identified in the Grand Avenue Northwest Corridor.

**Exhibit ES.1**  
**Summary of Transit Needs**

<b>Need</b>	<b>Timeframe</b>
The regional bus system needs to be extended through the study corridor into Surprise, El Mirage, Sun City and Sun City West.	Short-Term
Bus stops in the study corridor need to be designed to maximize passenger safety and comfort.	Short-Term
Paratransit (including dial-a-ride) services throughout Northwest Corridor communities require restructuring to better meet travel needs, especially those of older residents.	Short-Term
Park-and-ride capacity is needed in the eastern portion of the corridor.	Short- to Mid-Term
Bus routes and dial-a-ride services will need to meet regional service standards.	Mid-Term
Surprise, Sun City and Sun City West will require improved alternatives for local circulation.	Mid- to Long-Term (depending on demand)
Park-and-ride capacity will be needed in the western portion of the corridor.	Mid- to Long-Term
Express and/or high-capacity transit, as an integral part of the regional system, may be needed in the future.	Short- to Mid-Term (studies); Mid- to Long-Term (implementation)

## ***Pedestrian Circulation***

Exhibit ES.2 summarizes existing deficiencies of and impediments to pedestrian travel. It also identifies the needs arising from these impediments and deficiencies.

**Exhibit ES.2  
Summary of Pedestrian Needs**

<b>Facility/Location</b>	<b>Pedestrian Travel Impediment or Deficiency</b>	<b>Need</b>
Grand Avenue, virtually entire length of corridor	No curbs or sidewalks exist.	Pedestrian facilities are needed to serve travel demand.
All railroad crossings along Grand, except at 107 <sup>th</sup> Avenue	Walkway surface types and conditions vary; crossings have not been improved for pedestrians.	Railroad crossings need to be safe and accessible for pedestrians.
Grand Ave through much of the corridor	Continuous walls separate the corridor from adjacent neighborhoods.	Connections between walled communities and pedestrian routes may be needed.
Grand Ave through much of the corridor	Channelized right turns lengthen intersection crossings.	Traffic flow speed and efficiency should be balanced against the needs of pedestrians at these intersections.
Entire corridor	No access exists to planned recreation routes.	Future connections to the West Valley Multi-Modal Corridor need to be planned.
Entire corridor	Destinations specifically along Grand Avenue and generally within the corridor are too far apart for convenient walking.	Transit services may mitigate long walk distances and development guidelines need to cater to pedestrian as well as auto access.
Grand Ave through much of the corridor	Little or no shade exists.	Opportunities for streetscape treatments and plans to enhance aesthetics and pedestrian comfort need to be formulated.
Various streets that serve the corridor	Sidewalks are narrow and immediately adjacent to motorized traffic.	Pedestrian safety and comfort need to be considered in improving connections to adjacent streets.

<b>Facility/Location</b>	<b>Pedestrian Travel Impediment or Deficiency</b>	<b>Need</b>
Grand Ave and major intersecting streets	Wide streets are difficult to cross quickly, especially for slower walkers (e.g., many seniors).	Traffic flow speed and efficiency should be balanced against the needs of pedestrians.

### ***Bicycle Circulation***

In recent years, bicycles have increasingly been recognized as an important component in an effective multimodal transportation system, both nationwide and in the MAG region. Bicycle transportation needs identified within the Grand Avenue Northwest Corridor are summarized in Exhibit ES.3.

**Exhibit ES.3  
Summary of Bicycle Transportation Needs**

<b>Need</b>	<b>Source</b>
Improved riding conditions for cyclists along the Grand Avenue Corridor from SR 101 to Loop 303.	MAG Regional Bicycle Plan, agency/public input, field observation
Grade-separated crossings of Grand Avenue and the railroad.	Agency/public input, MAG Bicycle Plan
Alternative routes for cyclists.	Agency/public input
A more direct route across Grand between El Mirage and Surprise CBDs.	Field observation and analysis
Recreational trails, including routes along the river beds.	Agency/public input
Convenient access between Grand Avenue Corridor and future off-street paths or trails, especially the West Valley Multi-Modal Corridor.	MAG Bicycle Plan, ROSS, Section 3.1.2 of this report
Bikeway connections between Grand Avenue and other regional facilities.	MAG Bicycle Plan, field observation
A continuous, interconnected bicycle network crossing jurisdictional boundaries.	MAG Bicycle Plan, other jurisdictional plans
Physical improvements to some railroad crossings.	Section 3.1.2 of this report
Enhanced aesthetics, comfort and amenities for bicyclists in the corridor.	Agency/public input, Section 3.1.2 of this report

### ***Golf Cart Circulation***

Numerous adult and retirement communities have been developed in Maricopa County, especially the Northwest Valley, during the last 40 years. Often built around golf courses with clubhouses and recreation centers, these communities promote a lifestyle that encourages the wide use of golf carts as everyday means of transportation. Among these communities, Sun

City, Sun City West and Sun City Grand all lie largely within the Grand Avenue Northwest Corridor. Youngtown also has a high proportion of seniors and retirees. Most of the golf carts operating in the Northwest Valley are classified as neighborhood electric vehicles (NEVs).

Exhibit ES.4 lists needs identified in the Grand Avenue Northwest Corridor Study relating to golf cart transportation.

**Exhibit ES.4**  
**Summary of Golf Cart Transportation Needs**

<b>Need</b>	<b>Source</b>
A safe and legal route between Sun City and Sun City West.	Field observation and analysis
Additional access between Sun City West and Sun City Grand.	Field observation
Possible signage to warn of golf cart crossings (e.g., of Grand Ave).	Field observation
Consideration of educational efforts for golf cart riders and other road users in areas with heavy golf cart travel.	MCDOT Northwest Valley Transportation Study
Inclusion of golf cart access, mobility and safety as a key issue in the upcoming MAG Northwest Area Transportation Study.	Scope of work for MAG NW Area Transportation Study
Determination of feasibility of NEVs along off-street corridors.	ROSS

## **1.0 INTRODUCTION**

This working paper assesses the alternative mode needs for the Grand Avenue Northwest Corridor. Alternative mode needs were identified based on input from the public and local agencies, review of previous studies and community plans, and field review of existing conditions.

This working paper is one of several being produced for the Grand Avenue Northwest Corridor Study. The list of papers and current status is noted below:

Working Paper #1	Related Studies and Plans (completed)
Working Paper #2	Current and Projected Socioeconomic Projections (completed)
Working Paper #3	Transportation Facilities and Conditions (completed)
Working Paper #4	Environmental Issues and Title VI/Environmental Justice (completed)
Working Paper #5	Major Issues, Goals, and Policies (completed)
Working Paper #6	Long-Term Roadway Needs (completed)
Working Paper #7	Alternative Mode Needs (completed)
Working Paper #8	Development and Evaluation of Options (under development)

These working papers form the basis of the final report to be prepared near the end of the project.

## **2.0 TRANSIT**

While public transit currently plays a minor role in the Grand Avenue Northwest Corridor (see Working Paper #3), its importance is expected to rise in the future. Growth in demand for transit services is fueled by changing demographics (i.e., the aging of the population), concerns about traffic congestion and air quality, and increasing recognition that alternatives to the private automobile are necessary to meet the basic mobility needs of the Phoenix metropolitan area.

Transit needs in the Grand Avenue Northwest Corridor can be divided into four categories: fixed route local bus service, neighborhood circulator service, paratransit (dial-a-ride) service, and express or high-capacity transit service (e.g. bus rapid transit, rail rapid transit, commuter rail).

### **2.1 Fixed Route Local Bus Service**

This type of service consists of conventional transit buses operating at regular intervals throughout the day on major streets, making frequent stops to receive and discharge passengers. It constitutes the backbone of the regional transit system. With the exception of Route 106 connecting Peoria with Boswell Memorial Hospital, the study corridor completely lacks this type

of service. On Grand Avenue itself, existing service terminates in downtown Peoria, nearly two miles short of SR 101 where the corridor begins.

The current absence of service is reflected in the following needs expressed by agency staff and citizens at a series of agency/community forums and at a public open house on September 27, 2000:

- Extend regional bus service into the study area as demand warrants.
- Enhance transit opportunities.
- Provide transit service and bus stops along Grand.
- Provide more choices of modes. Many residents of the study area need alternative modes.

In addition, a series of MAG public forums on senior mobility issues in the spring of 2001 elicited the following ideas from attendees: more bus stops, mid-bus stop drop-offs, more routes and more frequent service on existing routes, sheltered stops with benches and misters, and neighborhood terminals.

In light of this input, a need exists for an extension of local bus service on Grand Avenue from Peoria to Surprise and Sun City West. According to service standards in the Valley Metro Short Range Transit Report and Long Range Transit Plan, this service should ultimately operate seven days a week, including evenings, with headways of no more than 15 minutes during peak periods and 30 minutes at most other times. The extended Grand Avenue bus route could interchange with routes proposed for Bell Road, Dysart Road and other intersecting streets. Given the large elderly population of the study area, there is a need for frequently spaced stops (every quarter-mile) with convenient pedestrian access and sheltered benches. Many existing Grand Avenue bus stops in Phoenix and Glendale are examples of what to avoid. Bus service implementation needs to be closely coordinated with related pedestrian improvements such as sidewalks along Grand.

## **2.2 Neighborhood Circulator Service**

This type of service typically uses small or medium buses on relatively short routes in areas that are not cost-effective to serve with conventional line-haul service. It is especially appropriate for communities such as Sun City and Sun City West with curvilinear street networks and limited connectivity to the regional roadway system. Circulator routes connect neighborhoods with local activity centers and with regional bus routes at designated transfer points. The unobtrusiveness of the smaller buses makes it easy for them to pull into the parking lots of neighborhood shopping centers and other popular destinations of retirees. Representatives of MAG member jurisdictions have requested consideration of circulators in the transit element of the MAG Northwest Area Transportation Study to be initiated later this year.

A circulator route known as Route NWV (Northwest Valley) operated for several years, connecting Sun City, El Mirage, Surprise and Sun City West. It was discontinued primarily because of low ridership. However, this route suffered from infrequent service, minimal

marketing, long travel times (due to the need for multiple crossings of Grand Avenue), and the absence of connections with regional transit except at Boswell Hospital, the east end of the route.

Once regional routes have been extended within and across the study corridor, neighborhood circulators offering more frequent and convenient service should be considered for Sun City, Sun City West and Surprise. Several such routes have recently been initiated in Tempe, and Phoenix will soon implement two routes in the Ahwatukee area. Neighborhood circulators have the potential to reduce the demand for dial-a-ride service, which is more expensive to provide. One of the draft recommendations of the MAG Regional Action Plan on Aging & Mobility calls for neighborhood circulators and community buses. In a recent MAG survey of senior citizens, the majority of respondents rated “neighborhood shuttle buses” as one of the two alternatives that would be most beneficial to seniors.

### **2.3 Dial-a-Ride Service**

Dial-a-ride is a form of paratransit (demand-responsive) service provided by the City of El Mirage, the City of Surprise and Sun Cities Area Transit currently covers most of the Grand Avenue Northwest Corridor. Coordination between the three operations is limited, however, and vehicles generally do not cross jurisdictional boundaries. Service is much less extensive in El Mirage and Surprise than in Sun City and Sun City West. There is a clear need for greater coordination and preferably consolidation of dial-a-ride service throughout the Northwest Valley (including Peoria and Glendale), as well as longer hours and improved response times. The East Valley Dial-a-Ride, which combined formerly separate programs in five East Valley cities, shows what has been achieved elsewhere in the region.

Specific needs expressed during the agency and public involvement process include:

- Improve local dial-a-ride service across jurisdictional boundaries.
- Enhance elderly mobility. (Seniors and persons with disabilities often have difficulty using the fixed route bus system.)

The City of Surprise identified dial-a-ride as a major transit issue during development of the scope of work for the upcoming MAG Northwest Area Transportation Study, which will address multimodal transportation needs throughout the Northwest Valley. The recent MAG public forums on senior mobility issues identified several specific needs, including: coordinate a regional paratransit system with central dispatching, allow dial-a-ride to cross boundaries (or make it easier to transfer between systems), allow seniors to call ahead a day or two to schedule pick-ups, and coordinate dial-a-ride with the bus system.

Dial-a-ride service is currently open to the general public in Glendale, Peoria, Surprise, El Mirage and the Sun Cities. In areas of the Valley with stronger bus service, eligibility is generally limited to seniors and persons with disabilities. Once bus service in the Northwest Valley improves to the levels prevailing elsewhere in the region, dial-a-ride eligibility may be similarly restricted. This issue will be addressed in the MAG Northwest Area Transportation Study.

## **2.4 Express/High-Capacity Transit Service**

Express and high-capacity transit services are designed to draw riders away from their automobiles, especially during peak travel periods, by offering greater speed and comfort than local bus service. The Phoenix metro area currently has a network of express bus routes offering very limited service during peak hours. None of this service extends to the Grand Avenue Northwest Corridor or anywhere in Peoria, El Mirage, Surprise or the Sun Cities.

Three types of express or high-capacity transit have been proposed for the Grand Avenue Northwest Corridor. The feasibility of each mode will be considered in Working Paper No. 8, Development and Evaluation of Investment Options.

*Bus Rapid Transit (BRT)* uses conventional or specially designed buses to provide rapid service between suburban park-and-ride facilities and the central business district. Phoenix will implement this type of service in 2003, primarily using high-occupancy vehicle (HOV) lanes on freeways. Buses will run approximately every 15 minutes in each corridor from 5:00 to 9:00 AM and 3:00 to 7:00 PM on weekdays. BRT can also operate as an all-day service. Under the recommended roadway alternative, Grand Avenue would remain an arterial with many traffic signals. To maintain high travel speeds in this environment, BRT would require exclusive bus lanes or HOV lanes, and possibly priority treatment at signalized intersections.

*Light Rail Transit (LRT)* is currently under design for a 2006 opening date in a 20-mile corridor extending from Chris-Town Mall in Phoenix to the East Valley Institute of Technology in Mesa. This Central Phoenix/East Valley line will run predominantly in reserved lanes on-street, although LRT can also operate in separate rights-of-way. A subsequent extension will bring the line north to Metrocenter, and an additional extension to downtown Glendale may be built if voters in that city approve funding in November 2001. MAG has identified a number of additional corridors, including Grand Avenue, for long-term consideration of light rail or other high-capacity transit. LRT on arterial streets requires exclusive track lanes, and benefits greatly from signal priority treatments. Stations are typically located approximately one mile apart, with parking available at some locations. Because of the distance from the regional core and the lead time required to design, finance and build LRT, this mode would probably not reach the Grand Avenue Northwest Corridor until 2020 or later.

*Commuter Rail* involves the operation of passenger trains, primarily during peak hours, on existing railroad lines. Usually these lines are shared with freight trains, as they would be in the Grand Avenue Northwest Corridor. Parking is almost always provided at suburban commuter rail stations. Unlike BRT and LRT, commuter rail service is not currently planned for the MAG region. Several communities have, however, expressed an interest in further study of commuter rail.

Citizens and agency staff expressed the following needs at the agency/community forums and public open house:

- Study high capacity transit alternatives to link the study area with other communities in metropolitan Phoenix.

- Consider passenger light rail service in the corridor.
- Consider commuter rail service in the BNSF right-of-way.
- Provide park-and-ride lots. (Grand Avenue/SR 101 was suggested as a location.)

Park-and-ride lots are an important element of any express or high-capacity transit system. The MAG Park-and-Ride Site Selection Study has designated the Grand Avenue/SR 101 interchange as a near-term “target area” for such a facility. A potential site that could accommodate up to 442 vehicles has been identified at the southeast corner of 91<sup>st</sup> and Olive Avenues in Peoria. In addition, Grand Avenue/Litchfield Road is a long-term target area for a park-and-ride lot; a proposed site with up to 250 stalls is located at the southwest corner of Bell and Dysart Roads in Surprise.

## 2.5 Summary of Transit Needs

Exhibit 2.1 summarizes transit needs in the Grand Avenue Northwest Corridor for three timeframes: short-term (zero to five years), mid-term (five to 10 years) and long-term (10 to 20 years). Short-term items are the most pressing needs that should be addressed immediately if funding were available. Mid-term needs are less pressing and depend on demand that may not yet exist in the relatively low-density areas that much of the corridor traverses. Long-term needs would be addressed 10 or more years in the future, for reasons of either feasibility or demand.

It should be emphasized that no funding currently exists to meet even the short-term transit needs. Working Paper No. 8 will discuss cost and implementation issues.

**Exhibit 2.1**  
**Summary of Transit Needs**

<b>Need</b>	<b>Timeframe</b>
The regional bus system needs to be extended through the study corridor into Surprise, El Mirage, Sun City and Sun City West.	Short-Term
Bus stops in the study corridor need to be designed to maximize passenger safety and comfort.	Short-Term
Paratransit (including dial-a-ride) services throughout Northwest Corridor communities require restructuring to better meet travel needs, especially those of older residents.	Short-Term
Park-and-ride capacity is needed in the eastern portion of the corridor.	Short- to Mid-Term
Bus routes and dial-a-ride services will need to meet regional service standards.	Mid-Term
Surprise, Sun City and Sun City West will require improved alternatives for local circulation.	Mid- to Long-Term (depending on demand)

Need	Timeframe
Park-and-ride capacity will be needed in the western portion of the corridor.	Mid- to Long-Term
Express and/or high-capacity transit, as an integral part of the regional system, may be needed in the future.	Short- to Mid-Term (studies); Mid- to Long-Term (implementation)

### **3.0 OTHER ALTERNATIVE MODES**

In addition to public transit, alternative transportation modes in the Grand Avenue Northwest Corridor include non-motorized (pedestrian and bicycle) travel, as well as motorized golf carts used for short to medium length trips, especially in the retirement communities of Sun City, Sun City West and Sun City Grand. These modes represent important alternatives to the automobile, especially for short trips. In an environment oriented primarily toward auto travel, they require special planning to achieve their potential.

#### **3.1 Pedestrians**

This section discusses the pedestrian needs for the Grand Avenue Northwest Corridor.

##### **3.1.1 Background**

Many issues were raised at the agency/community forums and the public meeting. From these issues, thirteen objectives for the corridor study were developed and are presented in Working Paper No. 5, *Major Issues, Goals, and Policies*.

Objectives of the corridor study that pertain to pedestrian travel include:

- Improve aesthetics of the corridor.
- Improve crossings of Grand Avenue and the railroad.
- Improve traffic operations at intersections.
- Improve safety within the corridor.
- Enhance elderly mobility.
- Enhance alternative mode travel within the corridor.

##### **3.1.2 Impediments to Walking**

There are many impediments to pedestrian travel within the Grand Avenue Northwest Corridor. Below is a summary of infrastructure impediments to walking:

1. No curbs or sidewalks. In the corridor, most intersecting streets have attached walkways ranging from 5 to 5.5 feet wide. Most are also edged with curb and gutter. Grand Avenue for the length of the corridor does not have curbs or walkways for much of its length. The exception is short stretches of sidewalk serving recently

- developed retail centers on the south side of Grand through Surprise northwest of Bell Road. Some of these walkways are detached and severely meandering, diverting pedestrians from a direct path of travel.
2. Railroad track crossings. Railroad trackway parallels Grand Avenue for the length of the corridor. All intersecting streets cross these tracks, and all the crossings are protected with crossing arms. However, the condition of the walkway surfaces at these crossings varies from wooden railroad ties to rubber matting. Only one crossing at 107<sup>th</sup> Avenue has been improved for pedestrians. This crossing is concrete trackway on one side of the roadway, with a five-foot walkway.
  3. Community walls that prevent direct connections. Much of the corridor is lined with masonry privacy walls, especially where residences back up to the roadway. This long continuous line of wall can prevent pedestrians from accessing a potential pedestrian corridor.
  4. Channelized right turns that lengthen intersection crossings. Lane configuration on Grand Avenue and intersecting streets, counting dedicated and channelized right turns as well as single and double left turns, create conflicts between turning cars and crossing pedestrians. A channelized right turn promotes free flow right turns, often confusing the pedestrian as to when crossing is safe. Protected left turn signal phasing can confuse pedestrians as to when it is safest to cross.
  5. No access to planned recreation routes. The West Valley Multi-Modal Corridor intersects Grand Avenue along this section. The corridor is planned as an interconnecting recreation trail system, linking several jurisdictions along the Agua Fria and New Rivers. There is currently no direct connection or identification of the system along the Grand Avenue Corridor where it crosses the New River bridge.
  6. Long distances between destinations. The distances between destinations are often well beyond the five to 10 minute walk (800 to 1,400 feet) commonly associated with pedestrian areas. Commercial destinations, however, are common on most of the major intersecting streets; some are located adjacent to residential areas. Some commercial areas are not directly connected via a walkway from major adjoining streets to their front doors. The pedestrian often is left to cross large areas of parking to reach business establishments.
  7. Little or no shade. A pedestrian in the desert needs shade in order to make the trip bearable for any distance, especially from May through October. The recommendation for shade on walkways in the region is 50% of the walkway surface shaded in the hottest time of the year. Lack of shade trees along Grand Avenue and intersecting streets is commonplace, even along existing walkways.
  8. Narrow existing sidewalks next to traffic. Most of the walkways in the corridor were built to the minimum MAG standard, which is an attached sidewalk, measuring five feet from back of curb to back of walk. Given the traffic volume, these facilities are inadequate for pedestrians to feel comfortable and safe walking for any distance.
  9. Wide roadways difficult to cross. Given the number of lanes for through travel and turning movements, especially on Grand Avenue itself, crossing distances have become long distances for pedestrians to cross during the allotted traffic signal timing phase. The crossing distance is a safety factor, especially if the population travels more slowly than the average person. This condition is likely, given the average age of the population in this corridor.

These impediments, except for the railroad crossings, are common in the MAG region. The more fundamental question is where there is a need for pedestrian facilities that is not being met.

### **3.1.3 MAG Pedestrian Plan**

The MAG Pedestrian Plan 2000 outlines a methodology for determining the latent demand for pedestrian facilities. The Pedestrian Plan evaluates where the need is greatest in the region by applying a formula to determine the latent demand. Exhibit 3.1 shows the four pedestrian activity area types defined in the Pedestrian Plan.

**Exhibit 3.1  
Pedestrian Activity District Classifications**

<b>Area Type Classification</b>	<b>Latent Demand Percentage</b>	<b>Description</b>
District	80%-100%	Represents areas of high intensity with a wide variety of land uses that have a regional appeal.
Campus	60%-79%	Represents high intensity areas with a single or limited mix of land uses.
Community	30%-59%	Represents areas of low to medium intensity.
Neighborhood	0%-29%	Represents areas of low intensity with a limited mix of land uses.

Within the Grand Avenue Northwest corridor, the following streets that cross Grand Avenue received ratings for Pedestrian Trip Activity. Grand Avenue was not rated because of its lack of pedestrian facilities. The ratings give some indication of the potential use of these streets by pedestrians.

- |                                     |            |
|-------------------------------------|------------|
| 1. 107 <sup>th</sup> Avenue (south) | 50 – 60%   |
| 2. 107 <sup>th</sup> Avenue (north) | 60 – 70%   |
| 3. El Mirage Road                   | 10 – 20%   |
| 4. Bell Road (west)                 | 10 – 20%   |
| 5. Bell Road (east)                 | 40 – 50%   |
| 6. Sunrise Blvd                     | 9% or less |
| 7. RH Johnson Blvd.                 | 30 – 40%   |
| 8. Thunderbird Road (east)          | 30 – 40%   |

These ratings reflect the latent demand for pedestrian activity. Defined similarly as in traffic demand modeling, latent demand means that there would potentially be pedestrians using these roadways, assuming no inhibitions to travel except distance. The above-listed routes serve areas in which pedestrians could reach attractors or generators of activity.

For instance, 107<sup>th</sup> Avenue north of Grand Avenue has a rating of 60 – 70%. This route is in the second highest category of potential to serve pedestrians. 107<sup>th</sup> Avenue has destinations that can

be defined as “high intensity areas with a single or limited mix of land uses...” that attract pedestrians. Boswell Memorial Hospital is an example of such a high-intensity land use near this portion of 107<sup>th</sup> Avenue.

For purposes of this study, this information can help provide insight into latent crossing demand at Grand Avenue intersections throughout the corridor. The above list implies that 107<sup>th</sup> Avenue, Bell Road and RH Johnson/Thunderbird Road may experience the greatest volume of pedestrians. (El Mirage Road does not cross Grand Avenue at this time.) Therefore, these crossings will need the most attention when future roadway improvements are made. All intersecting streets should be evaluated for safe railroad track crossing and ADA accessibility.

To determine whether pedestrians would actually use these routes, the Roadside Pedestrian Condition Model must be applied. This is a scientific method for determining pedestrians’ sense of comfort while walking along a given roadway. The model accounts for several measurable traffic and roadway variables such as lateral separation between pedestrians and vehicles, average daily traffic (ADT), speed of traffic, percent of trucks, number of travel lanes, and other features such as landscaping, all of which affect whether people will walk the route. The model establishes a Level of Service to determine how well the roadway performs for pedestrians.

Based on the pedestrian plan, the desired Level of Service (LOS) for routes within the Study Area ranges from LOS B to LOS C. However, local jurisdictions can choose to meet a higher standard due to other factors.

As an example, 107<sup>th</sup> Avenue has an existing rating of F. The Pedestrian Plan gives designers options for improving the walking environment, particularly with regard to the sense of safety or comfort afforded to pedestrians.

Based on latent demand and the type of roadway, traffic characteristics and land uses adjacent to 107<sup>th</sup> Avenue, this roadway should meet a minimum standard of LOS C: Community Level. Bell Road and RH Johnson/Thunderbird should also meet a minimum service level of C.

Grand Avenue can also be rated for latent demand. This portion of the corridor received a rating of F. There are several factors in addition to comfort and safety for the pedestrian that require consideration before establishing whether there is a need to establish a pedestrian corridor where currently none exists. To determine the need for such a corridor along Grand Avenue where none exists today, the following questions must be addressed:

1. What are the likely destinations for pedestrians? What would be the purpose of the trip – recreation? Fitness? Or other?
2. Who will use the facility? Should the path be a shared use (with bicycles) facility?
3. Are the distances to be traveled reasonable for pedestrians to cover in an urban environment?
4. What improvements, such as shade trees and other amenities, need to accompany placing a new walkway along this section?
5. Will the improvement of this section of roadway for pedestrians also have the potential to serve other community needs, such as aesthetic improvement to the corridor?

6. How will the facility be accessed from local neighborhoods and streets?

### **3.1.4 Elderly Mobility Initiative**

In 2001, MAG initiated a planning effort to understand how the dramatic increase in the number of senior Americans will affect the region. This initiative and its findings have direct applicability to the Grand Avenue Northwest Corridor because the corridor serves a number of age-restricted communities. Youngtown, Sun City, Sun City West, and Sun City Grand are all centers of retirement-age individuals. A 30-member MAG Working Group has been conducting discussions with community groups regionwide to develop a Regional Action Plan on Elderly Mobility that focuses on safety, accessibility, affordability, and independence.

According to recent statistics, by 2010 (the planning horizon for this study), elderly drivers will account for 11% of total annual mileage for all drivers in the USA. By 2030, 20% of all drivers in the US will be seniors.

Nationally, among persons over 65, 7% of men and 9% of women walk as a means of transportation in urban areas. We expect to see dramatic increases in the elderly population in coming years, at the same time that the elderly are seeking ways in which to “age in place.” A recent analysis of elderly perception and reaction at signal-controlled crosswalk intersections documents a 31% rise in elderly pedestrian accidents from 1998 to 1999. After analyzing accident data, the study offers some important facts in designing infrastructure:

- Differences in perception/reaction time, acceleration rate and steady state walking velocity indicate that 6% of the elderly are unable to complete the crossing before opposing traffic obtained a green light;
- Decreased cognitive, sensory and motor abilities as well as decreases in physical strength and structure place the elderly at higher risk of death as a result of an accident;
- Pedestrians 51 and older tend to stand farther away from the curb;
- Elderly females are the most at-risk group;
- Elderly pedestrians aged 55 to 74, especially women, tend to overestimate the traveling speed of the vehicle at low speeds and to underestimate at higher speeds;
- Elderly pedestrians have trouble negotiating crosswalks and busy intersections because of the variability, speed, and complexity of traffic situations, leaving them with feelings of anxiety and stress due to a reduction in cognitive function;
- Elderly pedestrians often show behavior patterns that are evasive, withdrawing, and indicative of passive resignation;

- Walking speeds range from a low of 1.16 meters/second to 1.4m/s (3.8 feet/second to 4.5 f/s) for both males and females over the age of 60. In another study, speeds ranged from 1.23 to 1.5 m/s (4.0 f/s to 4.9 f/s) for those from 60 to 80 years old; this is 18% to 28% lower than among the general pedestrian population;
- Curb delay, distance from the curb, height of the curb, functional ability, psychological differences, and use of ambulation assistance devices are all factors to consider beyond walking velocity;
- Designing crosswalks and signal controls for areas with a higher percentage of elderly should be done with a great deal of caution and consideration for the special needs of the elderly.

The Elderly Mobility study is in the process of finalizing recommendations for the region. When the recommendations become available, a review of their applicability to this study will be conducted.

### **3.1.5 Summary of Pedestrian Deficiencies and Needs**

Exhibit 3.2 summarizes existing deficiencies of and impediments to pedestrian travel. It also identifies the needs arising from these impediments and deficiencies.

**Exhibit 3.2  
Summary of Pedestrian Needs**

<b>Facility/Location</b>	<b>Pedestrian Travel Impediment or Deficiency</b>	<b>Need</b>
Grand Avenue, virtually entire length of corridor	No curbs or sidewalks exist.	Pedestrian facilities are needed to serve travel demand.
All railroad crossings along Grand, except at 107 <sup>th</sup> Avenue	Walkway surface types and conditions vary; crossings have not been improved for pedestrians.	Railroad crossings need to be safe and accessible for pedestrians.
Grand Ave through much of the corridor	Continuous walls separate the corridor from adjacent neighborhoods.	Connections between walled communities and pedestrian routes may be needed.
Grand Ave through much of the corridor	Channelized right turns lengthen intersection crossings.	Traffic flow speed and efficiency should be balanced against the needs of pedestrians at these intersections.
Entire corridor	No access exists to planned recreation routes.	Future connections to the West Valley Multi-Modal Corridor need to be planned.

<b>Facility/Location</b>	<b>Pedestrian Travel Impediment or Deficiency</b>	<b>Need</b>
Entire corridor	Destinations specifically along Grand Avenue and generally within the corridor are too far apart for convenient walking.	Transit services may mitigate long walk distances and development guidelines need to cater to pedestrian as well as auto access.
Grand Ave through much of the corridor	Little or no shade exists.	Opportunities for streetscape treatments and plans to enhance aesthetics and pedestrian comfort need to be formulated.
Various streets that serve the corridor	Sidewalks are narrow and immediately adjacent to motorized traffic.	Pedestrian safety and comfort need to be considered in improving connections to adjacent streets.
Grand Ave and major intersecting streets	Wide streets are difficult to cross quickly, especially for slower walkers (e.g., many seniors).	Traffic flow speed and efficiency should be balanced against the needs of pedestrians.

### **3.2 Bicycle Circulation**

In recent years, bicycles have increasingly been recognized as an important component in an effective multimodal transportation system, both nationwide and within the MAG region. Many of MAG's member jurisdictions, including the Maricopa County Department of Transportation (MCDOT), which is responsible for roadways in Sun City and Sun City West, have developed bicycle plans and constructed on-street and off-street bikeways. Among other jurisdictions in the Grand Avenue Northwest Corridor area, the City of Surprise has included several policies to further the objective of a connected bicycle network in its *General Plan 2020*. MAG has adopted both a Regional Bicycle Plan (revised January, 1999) and a Regional Off-Street System Plan (February, 2001).

The following bicycle-related needs were identified at the agency/community forums and September 2000 open house.

- Improve aesthetics of the corridor.
- Construct grade-separated crossings of Grand Avenue and the railroad.
- Improve traffic operations at intersections.
- Improve safety within the corridor.
- Enhance alternative mode travel within the corridor.
- Develop recreational trails, including routes along the dry river beds.
- Provide alternative routes for cyclists.

On Grand Avenue, as on all arterial streets in the region, bicycles are permitted to share the right travel lane with motor vehicles. This is expected to continue if Grand Avenue becomes an enhanced arterial with both grade separations and signalized intersections. Neither Grand Avenue nor its intersecting streets in the study area currently have any special provisions for cyclists.

From SR 101 to 111<sup>th</sup> Avenue, both sides of Grand Avenue have edge stripes but generally very narrow shoulders. The shoulder widths are often less than the four feet specified in the American Association of State Highway & Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities* as the minimum necessary to accommodate bicycle travel, when shoulders are intended to be used for this purpose. (AASHTO recommends greater widths where automobile speeds exceed 35 mph, and MCDOT specifies a minimum width of six feet on urban principal arterials.) As a result, cyclists must share the right lane with high-speed motorized traffic on Grand, creating potential safety hazards and possibly discouraging bicycle travel. This situation is exacerbated by the lack of suitable alternative or parallel routes. Bell Road, the nearest alternative, is a poor route for bicycles because of its relatively narrow lanes, greater traffic congestion, absence of shoulders, and lower speed limit (in Sun City, outside the study corridor) that allows golf carts to share the road.

From 111<sup>th</sup> Avenue to SR 303, Grand Avenue has much wider shoulders. Here the typical shoulder width is six to 10 feet, except at signalized intersections. However, AASHTO recommends wide curb lanes or bicycle lanes rather than shoulders under urban conditions.

The MAG Regional Bicycle Plan sets forth many goals and objectives for bicycle travel in the region. Those most pertinent to this study include the following:

- Provide intermodal connections and connections across city boundaries. (Grand Avenue is one of the principal regional arterials providing such connections.)
- Provide a variety of facility types, with a focus on bicycle lanes and paths.
- Restripe existing roadways, when feasible, to gain space for bike lanes or edgeline buffer zones. Widen curb lanes during reconstruction or repaving to provide space for bike lanes or edgeline buffer zones. Include bike lanes in all new arterial roadway construction.
- Develop multi-use pathways that are connected with street system pathways and that provide access to local and regional destinations. Provide grade separations such as bridges and tunnels to maintain connectivity of bikeways over barriers such as canals, freeways, *high volume arterial streets*, etc. (Emphasis added.)
- Remove or alleviate barriers to safe bicycle travel, such as substandard arterial freeway crossings, parallel drain grates, *railroad crossings*, asphalt ridges, curb lane choke points, etc. (Emphasis added.)

- Install bicycle detection devices at traffic signals and provide signal timing that ensures adequate crossing time for bicyclists. Provide bicycle lanes to the left of right turn only lanes at arterial intersections with appropriate transitional signing and striping.

The Regional Bicycle Plan identifies a recommended bikeway facility on Grand Avenue along the entire length of the study corridor. The type of facility is not specified, and the bikeway is shown as “neither existing nor planned.”

The following additional facilities that penetrate the Grand Avenue Northwest Corridor appear in the MAG Regional Bicycle Plan:

- Bell Road, 99<sup>th</sup> Avenue to Cotton Lane (neither existing nor planned)
- 99<sup>th</sup> Avenue/Lake Pleasant Road, Glendale Avenue to Carefree Highway (neither existing nor planned)
- Litchfield Road, Bell Road to Camelback Road (neither existing nor planned)
- Proposed multi-use paths along the New River, Agua Fria River and Beardsley Canal

The MAG Regional Off-Street System Plan (ROSS) is the primary regional planning document for non-motorized paths and trails in existing corridors such as rivers, washes, canals, railroads and utility lines. The Off-Street System Plan identifies several potential routes crossing the Grand Avenue Northwest Corridor, including the New and Agua Fria rivers. Creating access between these future routes and Grand Avenue is a need that will have to be addressed.

Objectives from the ROSS that are especially pertinent to this study include the following:

- Design an off-street path/trail system that provides a sufficient number of access points to provide access to numerous users.
- Connect origins and destinations with continuous and direct off-street routes to encourage non-motorized travel.
- Provide grade separations to maintain connectivity of paths/trails over barriers such as freeways and high-speed, highly traveled roadways.
- Link the off-street non-motorized transportation system with the on-street system (such as bicycle lanes and wide outside lanes along arterial streets) and other modes of transportation (such as bus routes, light rail and park-and-ride lots) to optimize opportunities for travel by bicyclists and pedestrians.

Both MCDOT and the City of Surprise operate and maintain roads that cross Grand Avenue within the study corridor. Hence it is important to consider key objectives and policies of the

two jurisdictions that relate to the Grand Avenue Northwest Corridor Study. These include the following:

***MCDOT*** (from 1999 Bicycle Transportation System Plan)

- Establish roadway cross sections with bicycle lanes as the Maricopa County roadway design standard.
- MCDOT shall include bicycle facilities on all County roadways as described in the *Roadway Design Manual* and *Pavement Marking Manual*. (These guidelines call for bicycle lanes on all newly constructed and reconstructed arterials.)
- Bicycle projects not directly combined with a larger roadway project shall be evaluated separately during the CIP process.
- The CIP shall rate projects with bicycle elements higher than projects without bicycle elements.
- Partners, contractors and customers of MCDOT are to be informed of the position of the County towards bicycle transportation and encouraged to follow the same standards and principles when working with the County.

***Surprise*** (from *General Plan 2020*)

- Develop an area-wide plan for the improvement and maintenance of a sidewalk/trailway system throughout the planning area.
- Provide on-road bicycle lanes on all arterials throughout the City of Surprise planning area.
- Bikeway projects not directly combined with a larger project shall be evaluated separately during the Capital Improvement Program (CIP) process.

Exhibit 3.3 lists bikeways proposed by MAG, MCDOT and the City of Surprise that would serve the Grand Avenue Northwest Corridor. The jurisdiction(s) responsible for each project are shown in italics. North-south facilities are listed from east to west and east-west facilities from south to north.

**Exhibit 3.3**  
**Proposed Bikeway Facilities, Grand Avenue Northwest Corridor**

<b>Location/Jurisdiction</b>	<b>Facility Type</b>	<b>Source</b>
Grand Avenue, Van Buren Street-SR 74 (includes entire length of study corridor). <i>ADOT</i>	Unspecified	MAG Regional Bicycle Plan (January 1999)
Along north Surprise city limit, approximately Dysart/Bell Road-BNSF Railroad; then along BNSF Railroad right-of-way, approximately Litchfield Road-Loop 303. <i>Surprise</i>	Off-street multi-use path	Surprise General Plan 2020
New River alignment, Skunk Creek-Agua Fria River. <i>Multi-agency</i>	Off-street bikeway or multi-use path	MAG Regional Bicycle Plan, West Valley Multi-Modal Corridor Plan (draft)
99 <sup>th</sup> Avenue, Beardsley Road-Olive Avenue. <i>Maricopa County</i>	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan (May 1999)
103 <sup>rd</sup> Avenue, Boswell Boulevard-Grand Avenue. <i>Maricopa County</i>	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan
Agua Fria River alignment, CAP Canal-Gila River. <i>Multi-agency</i>	Off-street bikeway or multi-use path	MAG Regional Bicycle Plan
El Mirage Road, Deer Valley Road-Bell Road. <i>Maricopa County</i>	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan
El Mirage Road, Bell Road-Paradise Lane. <i>Surprise</i>	Bike lanes	Surprise General Plan 2020
Dysart Road, Bell Road-Greenway Road. <i>Surprise</i>	Bike lanes	Surprise General Plan 2020
Litchfield Road, Bell Road-Camelback Road. <i>Maricopa County, Surprise, Glendale</i>	Bike lanes or edge line buffer zones	MAG Regional Bicycle Plan
Reems Road, Grand Avenue-Peoria Avenue. <i>Surprise, Maricopa County</i>	Bike lanes	Surprise General Plan 2020
Thunderbird Road, Peoria City Limit-99 <sup>th</sup> Avenue. <i>Maricopa County</i>	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan
Waddell Road, Dysart Road-Cotton Lane. <i>Maricopa County, Surprise</i>	Bike lanes or edge line buffer zones	MCDOT Bicycle System Plan
Greenway Road, Grand Avenue-Trilby Wash Basin. <i>Surprise, El Mirage, Maricopa County</i>	Bike lanes	Surprise General Plan 2020

<b>Location/Jurisdiction</b>	<b>Facility Type</b>	<b>Source</b>
Bell Road, 99 <sup>th</sup> Avenue-Grand Avenue. <i>Maricopa County, Surprise</i>	Bike lanes or edge line buffer zones	MAG Regional Bicycle Plan
Bell Road, Grand Avenue-Sun Valley Parkway. <i>Surprise</i>	Edge line buffer zones	MAG Regional Bicycle Plan
Mountain View Boulevard, Parkview Place-Sunrise Boulevard. <i>Surprise</i>	Bike lanes	Surprise General Plan 2020
Loop 303, Waddell Road-Lake Pleasant Road.* <i>Maricopa County, Surprise</i>	Bike lanes	MCDOT Bicycle System Plan

\*If Loop 303 becomes a freeway, an alternative facility must be found.

Exhibit 3.4 summarizes bicycle transportation needs in the Grand Avenue Northwest Corridor. This table specifies which needs emerged through the agency/public input process and which were identified by other means. Recommendations for the Grand Avenue Northwest Corridor will be addressed in Working Paper No. 8.

#### **Exhibit 3.4 Summary of Bicycle Transportation Needs**

<b>Need</b>	<b>Source</b>
Improved riding conditions for cyclists along the Grand Avenue Corridor from SR 101 to Loop 303.	MAG Regional Bicycle Plan, agency/public input, field observation
Grade-separated crossings of Grand Avenue and the railroad.*	Agency/public input, MAG Bicycle Plan
Alternative routes for cyclists.	Agency/public input
A more direct route across Grand between El Mirage and Surprise CBDs.	Field observation and analysis
Recreational trails, including routes along the river beds.*	Agency/public input
Convenient access between Grand Avenue Corridor and future off-street paths or trails, especially the West Valley Multi-Modal Corridor.	MAG Bicycle Plan, ROSS, Section 3.1.2 above
Bikeway connections between Grand Avenue and other regional facilities.	MAG Bicycle Plan, field observation
A continuous, interconnected bicycle network crossing jurisdictional boundaries.	MAG Bicycle Plan, other jurisdictional plans
Physical improvements to some railroad crossings.*	Section 3.1.2
Enhanced aesthetics, comfort and amenities for bicyclists in the corridor.	Agency/public input, Section 3.1.2

\*Also applies to pedestrians.

### **3.3 Golf Cart Circulation**

Numerous adult and retirement communities have been developed in Maricopa County, especially the Northwest Valley, during the last 40 years. Often built around golf courses with clubhouses and recreation centers, these communities promote a lifestyle that encourages the wide use of golf carts as everyday means of transportation. Among these communities, Sun City, Sun City West and Sun City Grand all lie largely within the Grand Avenue Northwest Corridor. Sun City Grand, the newest of the three Del Webb communities, is in Surprise; the others lie within unincorporated Maricopa County. Youngtown also has a high proportion of seniors and retirees. During a recent visit to the corridor, many golf carts were observed on the street system, particularly in Sun City West and Sun City Grand. Most of the golf carts operating in the Northwest Valley are classified as neighborhood electric vehicles (NEVs).

Traveling to and from the golf course is only one of the many reasons people drive their golf carts. Several years ago, MCDOT conducted a survey of golf cart users. The results indicated that owners of golf carts use them often and to do everything that they would normally do with an automobile, such as visit friends, go to the store and run errands.

On most streets in adult communities, golf carts and automobiles share the road successfully. Anyone using a motorized cart on a public road must be a licensed driver, however. Arizona law (ARS §28-966) restricts neighborhood electric vehicles as follows:

1. A neighborhood electric vehicle shall not be operated at a speed of more than 25 mph.
2. A neighborhood electric vehicle shall not be driven on a highway that has a posted speed limit of more than 35 mph. This subsection does not prohibit a neighborhood electric vehicle from crossing a highway with a speed limit higher than 35 mph at an intersection.
3. A neighborhood electric vehicle shall have a notice of the operational restrictions applying to the vehicle permanently attached to or painted on the vehicle in a location that is in clear view of the driver.

The second of these restrictions precludes the operation of golf carts on Grand Avenue, Bell Road and 99<sup>th</sup> Avenue within the study corridor. Grand Avenue has a speed limit of 45 mph in most of the corridor, while Bell Road and 99<sup>th</sup> Avenue have speed limits of 40 mph in the vicinity of Grand Avenue. As a result, the primary golf cart crossings of Grand Avenue are located at 103<sup>rd</sup>, 107<sup>th</sup>/Del Webb, 111<sup>th</sup> and 113<sup>th</sup> Avenues in Sun City/Youngtown; and at Reems Road/Meeker Boulevard and Sunrise/RH Johnson Boulevard in Sun City West/Sun City Grand.

No county ordinances or MCDOT policies currently govern the use of golf carts on public roads in Sun City and Sun City West, which are located in unincorporated Maricopa County. MCDOT's main concern has been to attempt to provide for safe crossings of major streets, where necessary, on a case-by-case basis.

The need for golf carts to reach destinations by crossing major roads makes for potentially hazardous situations, as does the use of golf carts to cross over into areas that are not signed or built to accommodate them. In Sun City Grand, special golf cart crossings have been signed and striped on streets that cross golf courses.

To accommodate the movement of people safely and efficiently, while reducing conflicts between travel modes, the following goals were incorporated in MCDOT's Northwest Valley Transportation Study, which covered the Grand Avenue Northwest Corridor and included participation from Surprise and Youngtown:

- Neighborhood and homeowners' associations, with assistance from the transportation department of the appropriate jurisdiction, should identify a safe circulation network for golf carts;
- Education efforts on safe and legal golf cart use should be developed and supported; and
- Efforts should be made to find safe and efficient alternatives to heavily traveled, major roadways that provide direct links to desired destinations such as shopping centers.

Golf carts are not permitted to use bike lanes, but they may share wide outside lanes and striped shoulders so long as they are not signed for bicycle use. The need to accommodate golf carts is one reason why MCDOT has not yet developed the planned bike lanes in the Sun Cities listed in Exhibit 3.3.

Exhibit 3.5 lists needs identified in the Grand Avenue Northwest Corridor Study relating to golf cart transportation. Interestingly, golf carts drew less attention during the agency and community involvement process than transit and non-motorized modes.

### **Exhibit 3.5**

#### **Summary of Golf Cart Transportation Needs**

<b>Need</b>	<b>Source</b>
A safe and legal route between Sun City and Sun City West.	Field observation and analysis
Additional access between Sun City West and Sun City Grand.	Field observation
Possible signage to warn of golf cart crossings (e.g., of Grand Avenue).	Field observation
Consideration of educational efforts for golf cart riders and other road users in areas with heavy golf cart travel.	MCDOT Northwest Valley Transportation Study
Inclusion of golf cart access, mobility and safety as a key issue in the upcoming MAG Northwest Area Transportation Study.	Scope of work for MAG NW Area Transportation Study
Determination of feasibility of NEVs along off-street corridors.	ROSS